Archiving and accessing a 'DNA register' for individual identification and stock structure of sperm whales in the Gulf of Mexico

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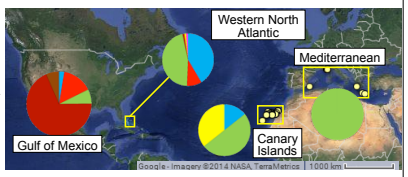
Abstract: *A growing number of large-scale, long-term studies of cetaceans and other marine megafauna are collecting spatially explicit records linked through individual identification by DNA profiles, photo-identification and telemetry. Here, we report initial progress with integrating these records for two studies of sperm whales in the Gulf of Mexico. Our objective is to develop a collaborative framework for the long-term monitoring of the health and life history of individuals in this isolated population.*

Sperm whales in the Gulf of Mexico

- Endangered (ESA, IUCN)
- Isolated, as reflected by maternally-inherited mtDNA
- Subject to anthropogenic threats
- The focus of multiple research projects



mtDNA haplotype frequencies in regional populations of sperm whales

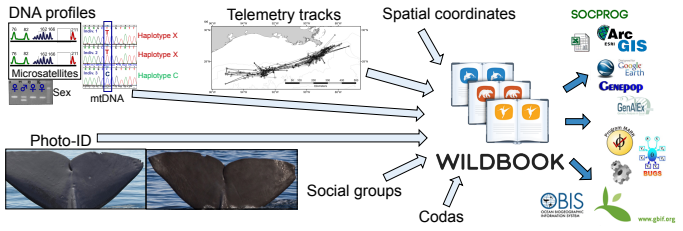
Why should we integrate data?

The integrated spatio-temporal records from photo-identification, DNA profiling, telemetry and associated data, can be used to:

- Document life history and track ranges of individuals
- Estimate abundance and trends through capture-recapture
- Infer close kinship, e.g., parent/offspring relationships
- Define management units or Distinct Population Segments
- Assess impacts of chronic environmental and catastrophic anthropogenic impacts, e.g. *Deepwater Horizon*

How will data be accessed?

http://www.wildme.org/wildbook



The web-based software, ***Wildbook,*** provides an integrated framework for distributed management of DNA profiles, photo-ID and other data linked to individual identity. The associated ***geneGIS*** tools provide for user-friendly visual exploration of spatio-temporal records and export for specialized analyses.

For further information
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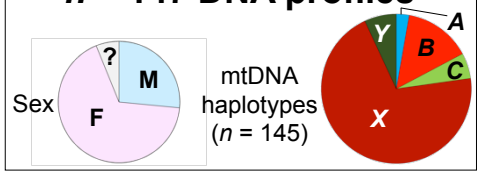
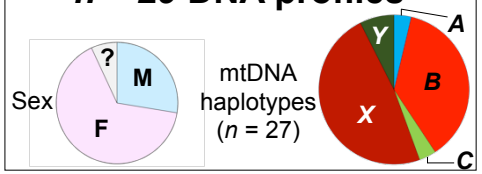
Progress so far…

DNA profiles (mtDNA haplotypes, microsatellite genotypes and sex) from biopsy samples collected during the Sperm Whale Seismic Study (SWSS) and, more recently, by the OSU Marine Mammal Institute, have been standardized for individual identification and matching.

SWSS (2000 – 2005)
n = 147 DNA profiles

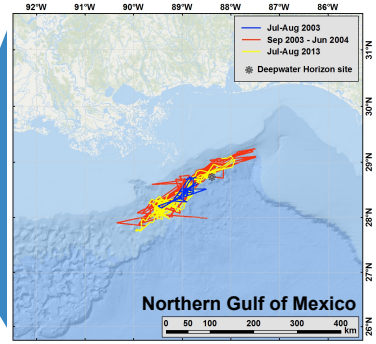


OSU (2011 – 2013)
n = 29 DNA profiles



From an initial review, four matching DNA profiles have been found between SWSS and OSU (below). One female was first sampled during SWSS in 2001 and tracked by satellite telemetry in 2003 and again in 2013. She was photo-identified only in 2003 and 2013.

	Year	Sex	mt DNA	Microsatellites							
				EV1	EV5	EV94	SW13	SW19	FCB1	GATA417	
1	SWSS1081406	2001	F	X	123 133	155 159	202 202	160 160	124 132	121 125	182 182
	OSU11GMX05	2011	F	X	123 133	155 159	202 202	160 160	124 132	121 125	182 182
2	SWSS2082304	2002	F	X	123 123	155 155	206 220	162 166	97 128	121 131	170 182
	OSU11GMX06	2011	F	X	123 123	155 155	206 220	162 166	97 128	121 131	170 182
3	SWSS1081801	2001	F	Y	123 123	159 167	212 226	162 164	122 128	121 129	182 186
	SWSS3070501	2003	F	NA	123 123	159 167	212 226	162 164	122 128	121 129	182 186
	OSU13GMX01	2013	F	Y	123 123	NA NA	212 226	162 164	122 128	121 129	182 186
4	SWSS2070702	2002	F	X	123 123	155 155	202 204	162 170	97 166	121 121	170 182
	OSU11GMX14	2011	F	X	123 123	155 155	NA NA	162 170	97 97	121 121	170 182



Satellite telemetry tracks of the female, SWSS3070501, tagged in 2003 (361 days total) and again in 2013 (42 days total)

We are now seeking funding to develop a collaborative ***Wildbook*** database to integrate DNA profiles with photo-identification records of sperm whales in the Gulf of Mexico.